Stem Cell Instrumentation Foundry

Grant Award Details

Stem Cell Instrumentation Foundry

Grant Type: Major Facilities

Grant Number: FA1-00614

Investigator:

Name:	John White
Institution:	University of California, Merced
Type:	PI

Award Value: $4,341,321

Status: Closed

Grant Application Details

Application Title: Stem Cell Instrumentation Foundry

Public Abstract:

The promise of stem cell-based therapies is critically dependent upon being able to direct stem cell decisions (i.e., pancreatic cells for diabetes, cardiac cells for cardiac diseases, neural cells for neurodegenerative disease, etc.). A fundamental understanding of the cues in the microenvironment that guide stem cell fate decisions is essential to develop strategies for disease-directed regenerative medicine. Development of robust, reproducible protocols for stem cell differentiation therapy is dependent upon a fundamental scientific understanding of the variables that influence stem cell fate decisions. The unique theme of our stem cell research program is quantitative analysis of single cells at the micro/nano-scale level using innovative molecular, cellular and bioengineering approaches to interrogate and manipulate individual cells in precisely controlled microenvironments.

The proposed Stem Cell Instrumentation Foundry (SCIF) will provide stem cell researchers throughout California access to advanced instruments, techniques and collaborators for single cell analysis. The SCIF will be housed in a 5,420 asf facility which includes Class 1000 and 100 clean rooms for micro/nano fabrication, facilities for human and mouse stem cell culture, quantitative cell imaging, and workstations. The SCIF is particularly unique because it will provide a range of microfluidic-based systems enabling researchers, with no prior knowledge of micro/nano techniques, to custom design devices online to their specific needs, rapidly adopting cutting edge research technologies. The SCIF will be equipped with advanced “collaboratory” technology to connect researchers to online support, workshops and collaborators. Ancillary core services include materials characterization, vivarium, and computational biology.

The SCIF will allow easier adoption of cutting edge technologies by stem cell researchers throughout California, and will provide service and training to participants so that they can fully understand and use these devices in their research. By disseminating research and technology outcomes to the community through on-line training, introductory courses and interactive laboratories, the SCIF will bring a new dimension of quantitative biology to stem cell researchers in California and enhance existing stem cell programs at our institution. In addition, establishing a cutting edge stem cell facility at our institution will allow a rapidly growing and underserved region of California to participate in and benefit from the opportunities generated by stem cell research, thereby ensuring that Prop71-mandated resources are distributed across California.

Statement of Benefit to California:	A fundamental understanding of the cues in the microenvironment that guide stem cell fate decisions is essential to develop strategies for stem cell-based regenerative medicine. The unique theme of our stem cell research program is quantitative analysis of single cells at the micro/nanoscale level using innovative molecular, cellular and bioengineering approaches to interrogate and manipulate individual cells in precisely controlled microenvironments. Development of robust, reproducible protocols for stem cell differentiation therapy is dependent upon a fundamental scientific understanding of the variables that influence stem cell fate decisions. The proposed Stem Cell Instrumentation Foundry (SCIF) will provide California's stem cell researchers with advanced instruments, techniques and collaborators to enable or enhance cell fate decision investigations at the micro/nanoscale. This unique resource will enable researchers, with no prior experience or knowledge of micro/nano techniques, to design custom devices online to their specifications and needs. For example, an investigator wishing to understand the role that calcium plays in the commitment to cardiac cells may design a device that enables precise manipulation of calcium levels in the environment and quantitative measurements of cell response to those manipulations. An investigator wishing to examine stem cells developing into neural cells may build a different device. The SCIF will reduce the activation energy for stem cell researchers throughout California to adopt new cutting edge technologies. In addition, the SCIF will provide training to participants so they can fully understand and use these devices in their research. By disseminating research and technology outcomes to the community at large through on-line training and introductory courses, the SCIF will bring a new dimension of quantitative biology to stem cell researchers in California. Our institution is located in a region of California with limited access to higher education and one of the fastest growing populations in the State. Establishing a cutting edge stem cell facility at our institution will ensure that this region participates in and benefits from the opportunities generated by stem cell research. Importantly, it will distribute the Prop71-mandated resources across California, rather than just at large established research centers. The proposed SCIF will attract quality stem cell researchers to the campus and the State, leveraging resources of multiple partners and collaborators. With close to 50% of our undergraduates enrolled in science and engineering majors, and close to 50% of the students from under-represented backgrounds, the SCIF will provide unprecedented opportunities to train the next generation of stem cell researchers, extending the benefits of state-of-the-art facilities to all segments of California.